PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-307350

(43)Date of publication of application : 23.10.2002

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(51)Int.Cl. B25J 13/00

B25J 5/00

B25J 13/08

G10H 1/00

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(54) ROBOT DEVICE, AND OPERATION CONTROL METHOD, CONTROL SYSTEM, PROGRAM AND RECORDING MEDIUM FOR THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a robot device capable of cooperatively act in response to the condition in the case of using several robot devices.

SOLUTION: This robot device 10a is provided with a dance signal receiver unit 11 for receiving the dance signal as the multiple operation information formed of several part operation signals through a communication unit 21, a dance signal analyzing unit 12 and a motion selector 14 for extracting the one's part operation information from the dance signal received by the dance signal receiver unit 11, and a motion controller 15 for controlling the drive of a driving unit 16 on the basis of the part operation information extracted by the dance signal analyzing

unit 12 and the motion selector 14.

LEGAL STATUS [Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The robot equipment carry out having a driving member, means of communications, a receiving means receive the multiplexing performance information which consists of two or more PERT performance information through the above-mentioned means of communications, a PERT performance-information extract means extract the PERT performance information of self from the above-mentioned multiplexing performance information which the above-mentioned receiving means received, and the control means of operation that control the drive of the above-mentioned driving member based on the PERT performance information which the above-mentioned PERT performance-information extract means extracted as the description.

[Claim 2] It is robot equipment according to claim 1 characterized by for the PERT performance information which constitutes the above-mentioned multiplexing performance information being described by abstract expression of

operation whose actuation is enabled in two or more kinds of robot equipments, and for the above-mentioned control means of operation translating the above-mentioned PERT performance information, acquiring a control signal, and controlling the drive of the above-mentioned driving member based on this control signal.

[Claim 3] the above -- the robot equipment according to claim 2 characterized by the abstract expression of operation being expressed by the focus of the purpose actuation.

[Claim 4] Based on the decision of charge of the PERT have a decision means assigned to PERT to determine PERT's charge, and according [the above-mentioned PERT performance information extract means] to the above-mentioned decision means assigned to PERT, it is robot equipment according to claim 1 characterized by extracting the PERT performance information of self from the above-mentioned multiplexing performance information.

[Claim 5] The above-mentioned decision means assigned to PERT is robot equipment according to claim 4 characterized by determining self PERT's charge based on the decision information assigned to PERT transmitted from other robot equipments through the above-mentioned means of communications.

[Claim 6] With reference to the robot equipment related information about robot

equipment, the PERT performance information which can perform self in the above-mentioned multiplexing performance information which the above-mentioned receiving means received is equipped with a PERT information creation means which can be performed to create the PERT information which shows the information which attached priority and which can be performed. The above-mentioned PERT information which can be performed is transmitted to other robot equipments through the above-mentioned means of communications. The above-mentioned decision means assigned to PERT Robot equipment according to claim 5 characterized by receiving the above-mentioned decision information assigned to PERT returned from robot equipment besides the above corresponding to the above-mentioned PERT information which can be performed through the above-mentioned means of communications, and determining self PERT's charge based on the above-mentioned decision information assigned to PERT.

[Claim 7] Robot equipment according to claim 6 characterized by including at least the property information on self memorized by other information or storage means about robot equipment in the above-mentioned robot equipment related information.

[Claim 8] Robot equipment according to claim 7 characterized by including self specification, capacity of operation, and engine-performance capacity in the

above-mentioned property information at least.

[Claim 9] The information about robot equipment besides the above is robot equipment according to claim 7 which is obtained by the communication link with other robot equipments which used the above-mentioned means of communications, and is characterized by including the information about the specification and the capacity of operation of the robot equipment in the information about robot equipment besides the above.

[Claim 10] Robot equipment according to claim 7 characterized by having a related information detection means to detect the information about robot equipment besides the above from the external-environment information which an external information detection means to detect the information on an external environment, and the above-mentioned external information detection means detected.

[Claim 11] It is robot equipment according to claim 10 which the information about robot equipment besides the above is equipped with the storage means memorized beforehand, and is characterized by for the above-mentioned PERT information creation means which can be performed to create the above-mentioned PERT information which can be performed using the information about the robot equipment besides the above beforehand memorized by the above-mentioned storage means.

[Claim 12] The information about robot equipment besides the above is robot equipment according to claim 7 characterized by being the number of robot equipment besides the above which exists in a self perimeter.

[Claim 13] The above-mentioned property information memorized by a storage means by which the property information which shows a self property is memorized, and the above-mentioned storage means is referred to. A PERT information creation means which can be performed to create the PERT information which shows the information which gave priority to the PERT performance information which can perform self in the above-mentioned multiplexing performance information which the above-mentioned receiving means received and which can be performed, Receive the above-mentioned PERT information on robot equipment which can be performed through the above-mentioned means of communications, and PERT's charge is determined based on this PERT information that can be performed. from other robot equipments -- being concerned -- others -- Robot equipment according to claim 1 characterized by having a decision means assigned to PERT to transmit the decision information assigned to PERT determined and acquired to other robot equipments.

[Claim 14] Robot equipment according to claim 13 characterized by including at least the self specification of robot equipment, capacity of operation, and

engine-performance capacity besides the above at the above-mentioned property information.

[Claim 15] It is robot equipment according to claim 1 which has received the auxiliary information added to each music data which the music information on 1 was divided, was multiplexed and was divided through the above-mentioned means of communications, and is characterized by for the above-mentioned control means of operation to control the drive of the above-mentioned driving member based on the above-mentioned PERT performance information synchronizing with the above-mentioned auxiliary information received in the real time through the above-mentioned means of communications.

[Claim 16] The above-mentioned auxiliary information is robot equipment according to claim 15 characterized by being the MIDI (Musical Instrument Digital Interface) signal added to digital audio data.

[Claim 17] The motion-control approach of the robot equipment which carries out [having the receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications with robot equipment, the PERT performance-information extract process that the above-mentioned multiplexing performance information which received at the above-mentioned receiving process to the above-mentioned robot equipment extracts the PERT

performance information of self, and the motion-control process which control the drive of the driving member of the above-mentioned robot equipment based on the PERT performance information which extracted at the above-mentioned PERT performance-information extract process, and] as the description.

[Claim 18] The PERT performance information which constitutes the above-mentioned multiplexing performance information is the motion-control approach of the robot equipment according to claim 17 characterized by to be described by abstract expression of operation whose actuation is enabled in two or more kinds of robot equipments, to translate the above-mentioned PERT performance information at the above-mentioned motion-control process, to acquire a control signal, and to control the drive of the above-mentioned driving member based on this control signal.

[Claim 19] the above -- the motion-control approach of the robot equipment according to claim 18 characterized by the abstract expression of operation being expressed by the focus of the purpose actuation.

[Claim 20] Based on the decision of charge of the PERT have the decision process assigned to PERT of determining PERT's charge, and according [the above-mentioned PERT performance information extract process] to the above-mentioned decision process assigned to PERT, it is the motion-control approach of the robot equipment according to claim 17 characterized by

extracting the PERT performance information of self from the above-mentioned multiplexing performance information.

[Claim 21] The motion-control approach of the robot equipment according to claim 20 characterized by determining self PERT's charge at the above-mentioned decision process assigned to PERT based on the decision information assigned to PERT transmitted from other robot equipments through means of communications.

[Claim 22] The PERT information creation process which creates the PERT information which shows the information which gave priority to the PERT performance information which can perform self in the above-mentioned multiplexing performance information received at the above-mentioned receiving process with reference to the robot equipment related information about robot equipment, and which can be performed and which can be performed, It has the transmitting process which transmits the above-mentioned PERT information which was created at the above-mentioned PERT information creation process which can be performed, and which can be performed to other robot equipments through means of communications. At the above-mentioned decision process assigned to PERT The above-mentioned decision information assigned to PERT returned at the above-mentioned transmitting process corresponding to the above-mentioned PERT information which was transmitted to robot equipment

besides the above, and which can be performed is received through means of communications. The motion-control approach of the robot equipment according to claim 21 characterized by determining self PERT's charge based on the above-mentioned decision information assigned to PERT.

[Claim 23] The motion-control approach of the robot equipment according to claim 22 characterized by including at least the property information on self memorized by other information or storage means about robot equipment in the above-mentioned robot equipment related information.

[Claim 24] The motion-control approach of the robot equipment according to claim 23 characterized by including self specification, capacity of operation, and engine-performance capacity in the above-mentioned property information at least.

[Claim 25] The information about robot equipment besides the above is the motion-control approach of the robot equipment according to claim 23 which is obtained by the communication link with other robot equipments which used means of communications, and is characterized by including the information about the specification and the capacity of operation of the robot equipment in the information about robot equipment besides the above.

[Claim 26] The motion-control approach of the robot equipment according to claim 23 characterized by having the related information detection process of

detecting the information about robot equipment besides the above from the external-environment information detected at the external information detection process of detecting the information on an external environment, and the above-mentioned external information detection process.

[Claim 27] The motion-control approach of the robot equipment according to claim 26 which has the storage process which memorizes the information about robot equipment besides the above beforehand for a storage means, and is characterized by to create the PERT information which can be performed at the above-mentioned PERT information creation process which can be performed using the information about the robot equipment besides the above beforehand memorized by the storage means at the above-mentioned storage process.

[Claim 28] The information about robot equipment besides the above is the motion-control approach of the robot equipment according to claim 23 characterized by being the number of robot equipment besides the above which exists in a self perimeter.

[Claim 29] The motion-control approach of the robot equipment according to claim 17 characterized by for the music information on 1 to have the receiving process which receives the auxiliary information added to each music data multiplexed [was divided and] and divided through means of communications, and to control the drive of the above-mentioned driving member based on the

above-mentioned PERT performance information by the above-mentioned motion-control process synchronizing with the above-mentioned auxiliary information received in the real time through the above-mentioned means of communications.

[Claim 30] The above-mentioned auxiliary information is the motion-control approach of the robot equipment according to claim 29 characterized by being the MIDI (Musical Instrument Digital Interface) signal added to digital audio data.

[Claim 31] The program characterized by to make robot equipment perform the receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications, the PERT performance-information extract process of extracting the PERT performance information of self from the above-mentioned multiplexing performance information which received at the above-mentioned receiving process, and the motion-control process which control the drive of a driving member based on the PERT performance information extracted at the above-mentioned PERT performance-information extract process.

[Claim 32] The record medium which carries out [that the program which makes robot equipment perform the receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications, the PERT

performance-information extract process of extracting the PERT performance information of self from the above-mentioned multiplexing performance information which received at the above-mentioned receiving process, and the motion-control process which control the drive of a driving member based on the PERT performance information which extracted at the above-mentioned PERT performance-information extract process is recorded, and] as the description.

[Claim 33] A broadcast means to broadcast the multiplexing performance information which consists of two or more PERT performance information, A driving member, means of communications, and a receiving means to receive multiplexing performance information through the above-mentioned means of communications, A PERT performance information extract means to extract the PERT performance information of self from the above-mentioned multiplexing performance information which the above-mentioned receiving means received, The control system of the robot equipment characterized by having two or more robot equipments equipped with the control means of operation which controls the drive of the above-mentioned driving member based on the PERT performance information which the above-mentioned PERT performance information extract means extracted.

[Claim 34] It is the control system of the robot equipment according to claim 33 characterized by for the PERT performance information which constitutes the

above-mentioned multiplexing performance information to be described by abstract expression of operation whose actuation is enabled in two or more kinds of robot equipments, and for the above-mentioned control means of operation to translate the above-mentioned PERT performance information, to acquire a control signal, and to control the drive of the above-mentioned driving member based on this control signal.

[Claim 35] the above -- the control system of the robot equipment according to claim 34 characterized by the abstract expression of operation being expressed by the focus of the purpose actuation.

[Claim 36] The robot equipment of one is robot equipment of a master among two or more above-mentioned robot equipments, and other robot equipments are robot equipment of a slave. The robot equipment of the above-mentioned slave A PERT information creation means which can be performed to create the PERT information which shows the information which gave priority to the PERT performance information which can perform self in the above-mentioned multiplexing performance information which the above-mentioned receiving means received with reference to the robot equipment related information about robot equipment and which can be performed, It has a decision means assigned to PERT to determine self PERT's charge based on the decision information assigned to PERT transmitted from the robot equipment of the above-mentioned

master through the above-mentioned means of communications. The PERT information creation means as the robot equipment of the above-mentioned slave which can be performed by which the robot equipment of the above-mentioned master is the same, From the robot equipment of the above-mentioned slave, the above-mentioned PERT information on the robot equipment of the slave concerned which can be performed is received through the above-mentioned means of communications. The charge of the PERT of all robot equipments is determined based on the PERT information which this PERT information that can be performed, and the PERT information creation means of self created and which can be performed. It has a decision means assigned to PERT to transmit the decision information assigned to PERT determined and acquired to the robot equipment of a slave. The above-mentioned PERT performance information extract means of the robot equipment of the above-mentioned slave It is based on the decision of charge of the PERT by the above-mentioned decision means assigned to PERT of self. The PERT performance information of self is extracted from the above-mentioned multiplexing performance information. The PERT performance information extract means of the robot equipment of the above-mentioned master The control system of the robot equipment according to claim 33 characterized by determining the charge of the self PERT of the decision

information assigned to PERT which the above-mentioned decision means assigned to PERT of self determined, and extracting the PERT performance information of self from the above-mentioned multiplexing performance information based on the decision of operation.

[Claim 37] The control system of the robot equipment according to claim 36 characterized by including at least the property information on self memorized by other information or storage means about robot equipment in the above-mentioned robot equipment related information.

[Claim 38] The control system of the robot equipment according to claim 37 characterized by including self specification, capacity of operation, and engine-performance capacity in the above-mentioned property information at least.

[Claim 39] The information about robot equipment besides the above is the control system of the robot equipment according to claim 38 which is obtained by the communication link with other robot equipments which used the above-mentioned means of communications, and is characterized by including the information about the specification and the capacity of operation of the robot equipment in the information about robot equipment besides the above.

[Claim 40] Each above-mentioned robot equipment is the control system of the robot equipment according to claim 38 characterized by having a related

information detection means to detect the information about robot equipment besides the above from the external-environment information which an external information detection means to detect the information on an external environment, and the above-mentioned external information detection means detected.

[Claim 41] It is the control system of the robot equipment according to claim 40 which each above-mentioned robot equipment is equipped with a storage means to by_which the information about robot equipment besides the above is memorized beforehand, and is characterized by for the above-mentioned PERT information creation means which can be performed to create the above-mentioned PERT information which can be performed using the information about the robot equipment besides the above beforehand memorized by the above-mentioned storage means.

[Claim 42] The information about robot equipment besides the above is the control system of the robot equipment according to claim 38 characterized by being the number of robot equipment besides the above which exists in a self perimeter.

[Claim 43] Each robot equipment is the control system of the robot equipment according to claim 33 which has received the auxiliary information added to each music data which the music information on 1 was divided, was multiplexed and

was divided through the above-mentioned means of communications, and is characterized by for the above-mentioned control means of operation to control the drive of the above-mentioned driving member based on the above-mentioned PERT performance information synchronizing with the above-mentioned auxiliary information received in the real time through the above-mentioned means of communications.

[Claim 44] The above-mentioned auxiliary information is the control system of the robot equipment according to claim 43 characterized by being the MIDI (Musical Instrument Digital Interface) signal added to digital audio data.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the record medium with which the program and such the program for controlling actuation of the motion-control approach of the detailed suitable robot equipment for coordination actuation with other robot equipments and robot equipment, the control system of robot equipment, and such robot equipment are recorded about the record medium

with which the program and such the program for controlling actuation of the motion-control approach of robot equipment and robot equipment, the control system of robot equipment, and such robot equipment are recorded.

[0002]

[Description of the Prior Art] In recent years, the robot equipment danced according to robot equipment and music which play a musical instrument is proposed.

[0003] There are some which are depended on the system which performs the live music of a musical instrument by including the driving means of an actuator etc. in the control unit of musical instruments, such as a piano, and controlling this driving means as robot equipment which plays a musical instrument.

[0004] Moreover, such a system has some which were applied to the performance actuation toy which performs performance actuation of a musical instrument, and has some which carry out performance actuation using the performance information for playing the musical instrument added to music data as a performance actuation toy. Furthermore, some which perform performance actuation have two or more performance actuation toys in a musical instrument for every PERT. Here, a MIDI (Musical Instrument DigitalInterface) signal etc. is mentioned as performance information on the musical instrument added to music data.

[0005] The performance actuation toy is equipped with a means to restore to the performance information on musical instruments, such as for example, a MIDI signal, a means to change performance information (for example, the note-on signal of the inside of a MIDI signal, and a specific channel and its note signal) into false performance information, and the driving means that operates according to false performance information. Furthermore, in order to perform synchronizing with two or more performance actuation toys, the performance actuation toy of these plurality is connected by physical means of signal transduction, such as a cable.

[0006] In performing with two or more performance actuation toys, the specific channel in performance information (PERT) is assigned by each equipment, and two or more performance actuation toys are made to perform respectively independent performance actuation. Thereby, two or more performance actuation toys cooperate, and it is made as [perform / performance actuation]. For example, there are some which are depended on the technique currently indicated by JP,2725528,B as such a performance actuation toy.

[0007] On the other hand, the robot equipment of the bipedal locomotion which performs coordination actuation, or quadrapedalism is proposed in recent years. As shown in drawing 12 as such robot equipment, it considers as a bipedal locomotion and there are robot equipment made into the configuration which the

appearance imitated to abbreviation human being, and the so-called pet mold robot equipment made with the configuration which the appearance imitated in the configuration of an abbreviation animal, having been used as quadrapedalism as shown in drawing 13 . One scene of the coordination actuation (for example, coordination dance) by the robot equipment of a bipedal locomotion is shown in drawing 14 and drawing 15 . Such coordination actuation is realized when each robot equipment reproduces the PERT beforehand assigned by each robot equipment according to music. In recent years, robot equipment is made possible [carrying out coordination actuation with other robot equipments in this way], and is becoming what has more high entertainment nature.

[0008]

[Problem(s) to be Solved by the Invention] By the way, as mentioned above, the channel (MIDI channel) assigned for coordination actuation was determined by the class of performance actuation toy. And although this assignment could be changed according to the number of the performance actuation toy which is on that occasion, or its property, it was beforehand set up by human being rather than was performed automatically. Since it is such, as the situation of performing a performance -- the class and the number of a performance actuation toy increasing -- becomes complicated, it becomes very more difficult to perform a

suitable setup.

[0009] Moreover, actuation of a performance actuation toy was as the quota which human being set up in advance, and unless assignment was changed, it was the same each time. It is hard to say that it has high entertainment nature that nurse and a result as expected is repeated for a person each time. The above mentioned can be similarly said about the robot equipment of the conventional bipedal locomotion or quadrapedalism.

[0010] Then, this invention is made in view of the above-mentioned actual condition, and aims at the motion-control approach of the robot equipment which enables activation of the coordination actuation according to the spot, and robot equipment, the control system of robot equipment, a program, and offer of a record medium.

[0011]

[Means for Solving the Problem] The robot equipment concerning this invention is equipped with a driving member, means of communications, a receiving means receive the multiplexing performance information which consists of two or more PERT performance information through means of communications, a PERT performance-information extract means extract the PERT performance information of self from the multiplexing performance information which the receiving means received, and the control means of operation that control the

drive of a driving member based on the PERT performance information which the PERT performance-information extract means extracted in order to solve an above-mentioned technical problem.

[0012] Robot equipment equipped with such a configuration controls the drive of a driving member by the control means of operation based on the PERT performance information which extracted the PERT performance information of self from the multiplexing performance information which received the multiplexing performance information which consists of two or more PERT performance information through means of communications with the receiving means, and the receiving means received with the PERT performance information extract means, and the PERT performance information extract means extracted. Thereby, robot equipment controls the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and makes actuation appear.

[0013] Moreover, the motion-control approach of the robot equipment concerning this invention The receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications with robot equipment in order to solve an above-mentioned technical problem, Robot equipment has the PERT performance information extract process of extracting the PERT performance

information of self, and the motion-control process which controls the drive of the driving member of robot equipment based on the PERT performance information extracted at the PERT performance information extract process from the multiplexing performance information received at the receiving process. Such a motion-control approach of robot equipment controls the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and makes actuation appear to robot equipment.

[0014] Moreover, the program concerning this invention makes robot equipment perform the receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications, the PERT performance-information extract process of extracting the PERT performance information of self from the multiplexing performance information received at the receiving process, and the motion-control process which control the drive of a driving member based on the PERT performance information extracted at the PERT performance-information extract process, in order to solve an above-mentioned technical problem. The robot equipment which controls actuation by such program controls the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and makes actuation appear.

[0015] Moreover, in order that the record medium concerning this invention may

solve an above-mentioned technical problem, the program which makes robot equipment perform the receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications, the PERT performance-information extract process of extracting the PERT performance information of self from the multiplexing performance information which received at a receiving process, and the motion-control process which control the drive of a driving member based on the PERT performance information which extracted at the PERT performance-information extract process is recorded. The robot equipment which controls actuation by the program recorded on such a record medium controls the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and makes actuation appear.

[0016] Moreover, the control system of the robot equipment concerning this invention is equipped with a broadcast means to broadcast the multiplexing performance information which consists of two or more PERT performance information in order to solve an above-mentioned technical problem. Moreover, the control system of robot equipment is equipped with two or more robot equipments equipped with a driving member, means of communications, a receiving means to receive multiplexing performance information through means

of communications, a PERT performance information extract means to extract the PERT performance information of self from the multiplexing performance information which the receiving means received, and the control means of operation that controls the drive of a driving member based on the PERT performance information which the PERT performance information extract means extracted.

[0017] The control system of robot equipment equipped with such a configuration broadcasts the multiplexing performance information which consists of two or more PERT performance information with a broadcast means, and robot equipment controls the drive of a driving member by the control means of operation based on the PERT performance information which extracted the PERT performance information of self with a PERT performance-information extract means from the multiplexing performance information which received multiplexing performance information with the receiving means through means of communications, and the receiving means received, and a PERT performance-information extract means extracted. Thereby, robot equipment controls the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and makes actuation appear.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail using a drawing. The gestalt of this operation applies this invention to the robot equipment which has right hand sides, such as the leg or an arm. As robot equipment, the robot equipment (henceforth animal mold robot equipment) of quadrapedalism and the robot equipment (henceforth humanoid robot equipment) of a bipedal locomotion as shown in drawing 12 and drawing 13 are mentioned, for example. By application of this invention, different robot equipment in basic structure can carry out coordination actuation now mutually.

[0019] As structure for performing coordination actuation, each has the component as shows various robot equipments to drawing 1 . As shown in drawing 1 , robot equipment 10a is equipped with the dance signal receive section 11, the dance signal analysis section 12, the dance PERT decision section 13, the motion selector 14, the motion controller 15, a mechanical component 16, a database 17, the transfer detecting element 18, the environmental recognition processing section 19, the sensor section 20, and the communications department 21.

[0020] It is made as [carry out / with other robot equipment (henceforth 2nd robot equipment) 10b / by such configuration / coordination actuation of the robot equipment (henceforth 1st robot equipment) 10a]. Here, about 2nd robot equipment 10b, it has similarly the configuration section of 1st robot equipment

10a as shown in drawing 1 . The 1st robot equipment is humanoid robot equipment shown in drawing 12 , and the 2nd robot equipment is animal mold robot equipment shown in drawing 13 . Hereafter, 1st robot equipment 10a is explained as a representative.

[0021] In the configuration of such robot equipment 10a, a mechanical component 16 constitutes a driving member and the communications department 21 constitutes means of communications. The dance signal receive section 11 A receiving means to receive the dance signal made into the multiplexing performance information which consists of two or more PERT performance information inputted by the cable etc. is constituted through means of communications (for example, communications department 21). The dance signal analysis section 12 and the motion selector 14 A PERT performance information extract means to extract the PERT performance information of self from the dance signal which the dance signal receive section 11 received is constituted. The motion controller 15 The control means of operation which controls the drive of a mechanical component 16 based on the PERT performance information extracted by the dance signal analysis section 12 and the motion selector 14 is constituted.

[0022] Robot equipment 10a can make now performing assigned actuation by the above configurations, and dance PERT's decision. In the above

configurations, the part as which the part for performing actuation to which the dance signal receive section 11, the dance signal analysis section 12, the motion selector 14, the motion controller 15, and the mechanical component 16 were assigned is constituted, and the dance PERT decision section 13, a database 17, the environmental recognition section 19, the sensor section 20, and the communications department 21 determine dance PERT is constituted. Dance PERT's decision is made in this way, and robot equipment 10a is grasping PERT's performance information which self's takes charge of (reception), it synchronizes the actuation based on the performance information assigned to PERT with auxiliary information, such as for example, a MIDI signal to which it is added by music information, and is performed. And when all robot equipments operate synchronizing with auxiliary signals, such as MIDI, it can nurse and a person can see actuation for these robots equipment as coordination actuation. Hereafter, the detail of each part of robot equipment 10a is explained.

[0023] The dance signal receive section 11 receives a dance signal. For example, from other signals, the dance signal receive section 11 sorts out a dance signal, and receives. The dance signal received by the dance signal receive section 11 is inputted into the dance signal analysis section 12. Moreover, about transmission of the dance signal to the dance signal receive section 11, it is realizable with broadcast by the broadcasting station (or

broadcast terminal). Or it is also realizable by transmitting a digital signal by digital signal Rhine, such as a cable.

[0024] The dance signal analysis section 12 analyzes a dance signal. The dance signal is constituted as follows.

[0025] Two or more performance information (for example, information for performing dance actuation) was multiplexed for every channel by the dance signal, and it goes into it. That is, as shown in (A) among drawing 2 , the dance signal constitutes two or more channels, independent performance information being used as PERT 1, PERT 2, PERT 3, and ... Moreover, about the performance information about each PERT, as shown in (B) among drawing 2 , it is constituted by the robot classification information about the class of robot equipment which can perform the motion information (PERT performance information) about the motion of the PERT concerned, and its motion which can be performed. PERT performance information is information for the corresponding robot equipment to operate, and the robot classification information which can be performed is information referred to in order that robot equipment may determine the PERT who can perform self. These information is explained in full detail later.

[0026] The dance signal analysis section 12 restores completely the dance signal with which such each PERT's performance information is multiplexed to a

meaning (or recovery). The dance signal analysis section 12 outputs the restored dance signal to the motion selector 14.

[0027] The motion selector 14 is classified according to the data which are having the inputted dance signal registered, and chooses PERT's motion information that it corresponds in it. By such motion selector 14, each robot equipment is two or more motions in a dance signal. It comes to choose from information the motion information on self (motion information which it takes charge of). The motion selector 14 sends the selected motion information made into PERT performance information to the motion controller 15.

[0028] The data with which it registers for classifying a dance signal here are PERT data obtained by the dance PERT decision section 13 mentioned later. This data is recorded in the PERT register of the motion selector 14. Acquisition of the PERT data based on the dance PERT decision section 13 is explained in full detail later.

[0029] Based on motion information, a mechanical component 16 is controlled by the motion controller 15.

[0030] Here, motion information is described by abstract expression of operation whose actuation is enabled in two or more kinds of robot equipments. For example, it is described by the abstract expression of operation like "raising an arm to the upper right." Furthermore, such an expression of operation is

expressed by the focus of the purpose actuation. For example, it is because it may be visible to actuation which raises an arm to the upper right as the whole actuation as this result so that may be made to move a fingertip as essence (focus) of that actuation in a predetermined orbit top (for example, on the orbit drawn toward the direction of the upper right). In such a case, the expression of operation was referred to as "A fingertip moves a predetermined orbit top."

[0031] Thus, motion information is described as a more abstract expression so that actuation may be made possible [an understanding] or possible in many robot equipments, and the motion controller 15 makes the so-called translation so that a low-ranking control section can understand such motion information, it transposes it to a control signal, and is made as [control / a mechanical component 16].

[0032] A mechanical component 16 is a part for making robot equipment drive. The mechanical component 16 consists of two or more mechanical components 161, 162, 163, ..., 16m. For example, mechanical components 161, 162, 163, ..., 16m are driving members driven by the motor. For example, when considering as the configuration which robot equipment imitated to an animal or human being, a mechanical component is a right leg (foot) and the left (foot). It is a right hand (arm) etc.

[0033] The motion controller 15 controls each mechanical components 161, 162,

163, ..., 16m which constitute a driving means 16. For example, when motion information consists of information which mentions an arm to the upper right, the motion controller 15 controls suitably the mechanical component which drives an arm so that the actuation which raises an arm to the upper right is reproduced.

[0034] Here, when two or more robot equipments of each are considered, each robot equipment is considered as various configurations. Since it is such, each motion controller 15 controls a mechanical component by each robot equipment based on the motion information of the PERT of charge, respectively, and actuation comes to appear with it. For example, although there is no tail section in humanoid robot equipment, there may be the tail section in animal mold robot equipment. In this case, actuation comes to be expressed by the tail in animal mold robot equipment.

[0035] And it comes to make actuation of the PERT in charge appear in each of each robot equipment, synchronizing with the MIDI signal made into the attached information on music information so that it may mention later. Thereby, it nurses and a person can appreciate now the coordination actuation by various robot equipments.

[0036] It is explanation about the component with which each robot equipment 10a is equipped for activation of the actuation of PERT which the above takes charge of based on a dance signal. Next, the component for decision of each

PERT for performing actuation in each robot equipment in this way is explained.

[0037] Let the sensor section 20 be an external information detection means in detection of the information on an external environment. The sensor section 20 consists of two or more external sensors 201, 202, 203, ..., 20p. For example, external sensors are the microphone which constitutes the distance robot (for example, PSD) for measuring the distance between CCD (Charge Coupled Device) which constitutes the vision of robot equipment 10a, and a body, and the acoustic sense of robot equipment 10a, a touch sensor (or pressure-sensitive sensor) which constitutes the tactile sense of robot equipment 10a. The signal detected by this sensor section 20 is outputted to the environmental recognition processing section 19.

[0038] The environmental recognition processing section 19 performs environmental recognition of robot equipment 10a of self based on the detecting signal from the sensor section 20. Specifically, the environmental recognition processing section 19 acquires the information about an external environment from the detecting signal obtained by the sensor section 20 as meaningful information. As information on an external environment, there is information about other robot equipments, such as information and a surrounding situation.

[0039] For example, as information about other robot equipments, the information about other number, its specification, and capacity of operation of

robot equipment is mentioned. The environmental recognition processing section 19 accumulates the information about such other robot equipments in the external-environment database 171 of the database section 17. Moreover, the environmental recognition processing section 19 is accumulated in the external-environment database 171 by making information, such as a surrounding situation, into an environmental map etc.

[0040] The database section 17 is constituted by the above-mentioned external-environment database 171 and the above-mentioned specification database 172. It is constituted by the specification database 172 using property information of self, such as own specification of robot equipment 10a, an athletic ability, and engine-performance information. For example, a self specification is information which shows the specification of robot equipment. Specifically, the information on the number about moving part, such as an arm or a foot, is mentioned. Moreover, an athletic ability is the information about the actuation which can be performed. Specifically, a drive pattern etc. is mentioned about moving part, such as an arm or a foot. Moreover, engine-performance capacity is the information about the self engine performance of operation.

[0041] The dance PERT decision section 13 determines dance PERT based on the information accumulated in such the database section 17. The dance PERT decision section 13 determines the dance PERT of self, and the dance PERT of

other robot equipments based on the information accumulated in the database section 17.

[0042] This invention is premised on aiming at implementation of the coordination actuation by two or more robot equipments, the robot equipment of 1 being considered as a master (namely, reader), and other robot equipments being made into a slave.

[0043] When dance PERT of other robot equipments is determined in robot equipment 10a when it considers as a reader, and it considers as a slave, robot equipment 10a has determined dance PERT of self based on the information of the assigned PERT who is transmitted from the robot equipment of a reader and who takes charge (recognition), and the dance PERT decision section 13 performs such processing.

[0044] First, regardless of the reader and the slave, all robot equipments have acquired the information of the PERT who can perform self by this dance PERT decision section 13 based on the dance signal acquired by the dance signal analysis section 12.

[0045] Furthermore, when robot equipment 10a is a reader, the dance PERT decision section 13 determines dance PERT of all robot equipments based on the information of the PERT who can perform other robot equipments transmitted from other robot equipments (for example, broadcast, broadcasting).

And the dance PERT decision section 13 transmits as PERT information in its duty about the dance PERT of other robot equipments (for example, broadcast, broadcasting). Moreover, the dance PERT decision section 13 registers the dance PERT of the determined self into the PERT register of the motion selector 14 about the dance PERT of self.

[0046] Here, the communications department 21 is a part which performs the communication link with an external instrument, acquires the information of the PERT who can perform from other robot equipments (2nd robot equipment 10b) recognized as an external instrument through this communications department 21, and accumulates this information in the external-environment database 171. As the communications department 21, the radio means using the so-called PC (Personal Computer) card is mentioned. Moreover, it is good also as a wire communication means using a cable etc.

[0047] In addition, although the information (for example, the number, a specification, or capacity of operation) about other robot equipments accumulated in the external-environment database 171 has been acquired through the sensor section 20 as mentioned above The information which acquired by communicating among other robot equipments not using the thing limited to this but using such the communications department 21, and this acquired can also be accumulated in the external-environment database 171 as

information about other robot equipments. On the other hand, when robot equipment 10a is a slave, the dance PERT decision section 13 transmits the PERT who can be performed to other robot equipments (robot equipment of a reader), and registers the dance PERT of self into the PERT register of the motion selector 14 based on the PERT in charge answered corresponding to it (for example, broadcast, broadcasting).

[0048] Thus, the dance PERT decision section 13 is constituted so that a function which is different when robot equipment 10a is a reader, and when robot equipment 10a is a slave may be made.

[0049] In addition, procedures, such as decision (the PERT information in their duty) of the dance PERT of all robot equipments based on the creation of PERT's information which can be performed performed to robot equipment 10a, and the information of the PERT who is transmitted from other robot equipments performed when robot equipment 10a is a reader and who can be performed, are explained in full detail later.

[0050] The above-mentioned motion selector 14 chooses motion information from the dance signal about PERT registered into the PERT register determined by this dance PERT decision section 13. Here, self (self made into the reader) is determined, or the PERT registered is determined by other robot equipments (robot equipment of a reader). In this motion selector 14, as mentioned above,

the selected motion information is sent to the motion controller 15.

[0051] Moreover, robot equipment 10a is equipped with the fall detecting element 18. The fall detecting element 18 detects the own fall of robot equipment 10a. In this case, the motion controller 15 detects the fall signal by the fall detection from the fall detecting element 18, outputs the command for the fall return according to it to a driving means 16, and changes it into fall return mode from dance mode. Thereby, robot equipment 10a gives priority to actuation of a fall return over the coordination actuation under activation, and performs it.

[0052] It is constituted robot equipment 10a being used as contents which the contents of the program of operation do not reverse in the case of normal operation (autonomous working), and actuation is made by such program execution of operation. However, in coordination actuation, robot equipment 10a comes to operate based on the performance information sent as a dance signal. Therefore, if it performs, when performance information which loses the balance of a posture and is reversed will have been transmitted as a dance signal, robot equipment 10a may be reversed. In such a case, a fall can be detected, priority can be given over actuation by the dance signal, and actuation of a fall return can be made to appear by the fall detecting element 18.

[0053] For example, when robot equipment is reversed in the usual mode, it may

have the actuation for returning a fall and robot equipment detects a fall in such a case, actuation of a fall return can be made to appear only by only changing into the usual mode.

[0054] Robot equipment 10a is constituted by above each part. The procedure in the case of reception of the dance signal in robot equipment 10a is shown in drawing 3 .

[0055] In robot equipment 10a, in step S1, the dance signal multiplexed by the dance signal receive section 11 starts reception, and a dance signal analysis machine performs separation and a recovery of a dance signal in continuing step S2. For example, suppose that the dance signal to which it restored is a thing about PERT 1 - PERT N by separation and a recovery of this dance signal.

[0056] Robot equipment 10a judges the PERT who can perform in step S3 in dance PERT 1 - N. Here, robot equipment 10a stores in a storage means the information (henceforth the PERT array information which can be danced) which arranged the PERT who can dance, when there is PERT in whom self is possible. Specifically, self has determined as follows the PERT array information which can be danced.

[0057] As mentioned above, specification, own athletic ability, own engine-performance information, etc. of robot equipment 10a as property information of self are stored in the specification database 172. And the

information (for example, the number, a specification, or an athletic ability) about other robot equipments is accumulated in the external-environment database 171. It distinguishes whether the dance PERT decision section 13 can perform robot equipment 10a about each PERT based on each PERT's robot classification information which was shown in (B) among drawing 2 added to the performance information of each PERT about the dance signal acquired by the dance analysis section 12 and which can be performed with reference to these property information or the information about other robot equipments.

[0058] And the PERT who can perform is generated as PERT array information which is made into array information and which can be danced. For example, the array of the PERT who can be danced is an array like [3N, 2, ...]. And this dance PERT's array is arranged by the priority. In this example, priority is determined in order of "3", "N", and "2." For example, such dance PERT's priority is determined as elated dance PERT's order. Thus, the PERT array information which can be danced is created by the PERT information creation function by the dance PERT decision section 13 which can be performed.

[0059] And robot equipment 10a distinguishes whether other robot equipments exist in step S4. That is, it distinguishes whether the robot equipment which may carry out coordination actuation exists in the perimeter. Distinction of whether other robot equipments exist judges existence of other robot equipments with

the data stored in the communications department 21 or the external-environment database 171.

[0060] Robot equipment 10a broadcasts the PERT array information on own which can be danced to other robot equipments by the communications department 21 in step S5, when other robot equipments exist.

[0061] And robot equipment 10a determines dance PERT in step S6. It is shown in drawing 4 and processing of dance PERT decision is explained in full detail later. Robot equipment 10a performs a dance motion in step S7 after dance PERT's decision. On the other hand, when other robot equipments do not exist in step S4, robot equipment 10a performs a dance motion in this step S7.

[0062] Moreover, when it is judged that there is no PERT who can perform in step S3, in step S8, robot equipment 10a creates an alternative motion, and performs the dance motion by that created alternative motion in this step S7. Creation of an alternative motion looks for that whose dance period suits from the fundamental actuation (motion primitive) registered beforehand, and is performed by creating periodic actuation. For example, about a dance period, an alternative motion is created with reference to a MIDI signal based on this MIDI signal.

[0063] Moreover, robot equipment 10a distinguishes fall detection in step S9 in the time of dance motion activation. When there is fall detection, robot

equipment 10a is changed into the mode of a fall return from dance mode, and makes actuation of a fall return appear in step S11. And robot equipment 10a distinguishes whether the dance is completed or not, after returning a fall. For example, it is because a fall return may take time amount, and since it thinks also when a fall return is carried out and the dance is already completed, such distinction is needed.

[0064] In step S10, when the dance is not completed, robot equipment 10a performs a dance motion again in step S7. Moreover, when the dance is completed, robot equipment 10a ends processing in dance mode.

[0065] Thus, robot equipment performs processing about a dance motion based on a dance signal. The procedure for the dance PERT decision in the above-mentioned step S6 is shown in drawing 4 .

[0066] As shown in drawing 4 , robot equipment 10a goes into the standby condition of broadcasting from other robot equipments (each robot equipment which carries out coordination actuation in the future) by distinction processing of the broadcasting reception from other robot equipments [in / for broadcasting from other robot equipments in step S21 / waiting processing and step S22]. When there is broadcasting, robot equipment 10a registers into a database 17 the data which progressed to step S23 and were received. Here, the data received by broadcasting are the PERT array information for every robot

equipment which can be danced.

[0067] And the received PERT array information which can be danced is memorized by the database. namely, for example, in a database, as received PERT array information which can be danced The PERT array [3N, 1, ...] from a certain robot equipment (robot equipment 1) which can be danced is described. Moreover, the PERT array [1, 2N, ...] from a certain robot equipment (robot equipment 2) which can be danced is described. Moreover, the PERT array [2N, 5, ...] from a certain robot equipment (robot equipment 3) which can be danced is described, and the PERT array [5, 8, 2, ...] from a certain robot equipment (robot equipment M) which can be danced is described.

[0068] And robot equipment 10a compares the number of robot equipment with a response with the number of the robot equipment which self including self recognizes in step S24. For example, it distinguishes whether 1 is added to the whole number and the whole number of replies (the number of responses) of robot equipment, and a value is in agreement.

[0069] By such distinction, if robot equipment 10a has the response from all robot equipments, when it will progress to step S25 and there will be no response from all other robot equipments, it progresses to step S21 and goes into a response waiting state. Here, in step S24, when there is no response from all robot equipments, it cannot progress to step S25 from step S24. When robot

equipment 10a does not have the response from all robot equipments in step S24 corresponding to such a thing into predetermined time amount, it is made to progress to step S25 automatically.

[0070] At step S25, as for robot equipment 10a, he distinguishes whether it is a reader. When he is a reader, robot equipment 10a progresses to step S26, and when he is not a reader, it progresses to step S28. About the processing after step S26, it becomes the processing which the robot equipment of a reader performs, and becomes the processing which the so-called robot equipment of a slave performs about the processing after step S28.

[0071] At step S26, robot equipment 10a in the case of a reader makes dance PERT's assignment decision. The PERT array information which has been transmitted from each robot equipment (each robot equipment of a slave) with which the database 17 was accumulated and which can be danced determines dance PERT's assignment. This PERT array information that can be danced is data transmitted from each robot equipment in step S23.

[0072] Robot equipment 10a made into the reader assigns dance PERT of each robot equipment using the PERT array which was accumulated in this database 17 and which can be danced. For example, dance PERT's assignment is performed using a performance index etc. Thereby, dance PERT of each robot equipment can be determined easily. For example, it determines using a

performance index as shown in (1) type.

[0073]

[Equation 1]

$$E = \sum_{k=1}^{N} F_k (R) \quad \cdots (1)$$

Here, F (R) is an evaluation value at the time of determining by the Rth candidate. About the performance index of the 1st, the 2nd, the 3rd, and ..., it comes to be obtained as F(1) =10, F(2) =5, F(3) =2, ..., etc. And what is necessary is just to ask for the group of Fk (R) which a performance index E makes max as the optimal dance PERT for each robot equipment using a performance index E.

[0074] The robot equipment of a reader determines dance PERT in this way, and tells the dance PERT (the PERT information in its duty) who takes charge to each robot equipment by broadcasting in step S27. And in step S7 shown in drawing 3 , the robot equipment of a reader chooses the motion information on self from a dance signal based on the PERT information in its duty, and performs a dance motion.

[0075] In step S28 and step S29 when it is presupposed on the other hand that he is not a reader in step S25, robot equipment (robot equipment made into

slave) 10a goes into the standby condition of broadcasting from the robot equipment of a reader by distinction processing of waiting processing and broadcasting reception of broadcasting from the robot equipment of a reader. And when there is broadcasting from the robot equipment of a reader, in step S7 shown in drawing 3 , robot equipment chooses the motion information on self from a dance signal based on the PERT information in its duty acquired by broadcasting, and performs a dance motion.

[0076] The PERT who takes charge of robot equipment can be determined by the procedure shown in the above drawing 3 and drawing 4 , and can perform now the dance motion about each PERT who takes charge with it.

[0077] In fact, a dance motion is performed synchronizing with the additional information or auxiliary information added to music data. That is, the decision of the PERT in each robot equipment which was mentioned above, and selection of the motion information from the dance signal based on the determined PERT are processings made before activation of an actual dance.

[0078] For example, as shown in drawing 5 , there are some by which additional information or auxiliary information D2n is added to music data D1n in a music data format. For example, the MIDI signal mentioned above corresponds to auxiliary information D2n in such a music data format. Each robot equipment takes a synchronization to auxiliary information D2n added to music data D1n in

this way, and reproduces a dance motion based on each PERT's motion information.

[0079] And each robot equipment holds the motion information which obtained such actuation before actual dance activation by the motion controller 15, and is controlling the mechanical component 16 based on motion information synchronizing with auxiliary information D2n detected behind. It can nurse and a person can appreciate actuation by such each robot equipment as that in which each robot equipment is carrying out coordination actuation according to music data.

[0080] In addition, about the technique of operating based on the auxiliary information (MIDI signal etc.) added to music data which were mentioned above, there is a technique of the performance toy equipment currently indicated as JP,2725528,B.

[0081] As mentioned above, the robot equipment with which this invention was applied can grasp situations, such as the number, movement engine performance, etc. of the robot equipment installed on that occasion, using means of communications with other robot equipments etc., and each robot equipment can choose the actuation according to a situation on that occasion. Thereby, the coordination actuation by two or more robot equipments is attained, and robot equipment can realize high actuation of the entertainment nature by

two or more robot equipments, such as a coordination dance.

[0082] Moreover, even if an execution environment becomes complicated about coordination actuation of the class and number increasing, it comes to perform a suitable setup automatically. Thereby, the actuation by the user [actuation / coordination] according to change of an execution environment becomes unnecessary at all.

[0083] Moreover, since a dance motion is not what the user set up in advance and was assigned, it is nursed and can realize playback of an always fresh motion for a person.

[0084] In addition, the robot equipment of a bipedal locomotion and the robot equipment of quadrapedalism were mentioned as the example, and the gestalt of above-mentioned operation explained them. However, it cannot be overemphasized that it is not limited to this. That is, for example, the appearance configuration is considered as other configurations and this invention can be applied also about robot equipment which is made into other configurations also about a driving member. The coordination actuation by various robot equipments is attained only by this being equipped with the configuration for realizing coordination actuation as an intersection.

[0085] For example, in robot equipment, there are some which are made exchangeable at the unit which it becomes from other structures (function), each

configuration section being used as a unit construction. In such a case, such, the robot equipment exchanged in the unit can choose optimal PERT according to the information, if self can hold the information by which unit exchange was carried out.

[0086] Moreover, as the gestalt of above-mentioned operation explained, the robot equipment of a reader (or master) determines each PERT, and is outputting the information of the PERT who determined to each robot equipment of a slave. Here, it is necessary to determine a reader out of two or more robot equipments. For example, each robot equipment holds the data (for example, data for reader selection) which consist of priority of the robot equipment which should serve as a reader as the technique of determining a reader (having memorized for the storage means as a database), and each robot equipment recognizes a reader based on this data for reader selection. For example, a reader is chosen from the class of other robot equipments grasped by a communication link or external detection (input of a camera, voice, etc.) with reference to the data for reader selection. Or it is made to make the robot equipment which had the interaction from a user by predetermined timing into a reader. For example, the robot equipment which detected that the head was struck by the user is determined as the reader.

[0087] Moreover, with the gestalt of above-mentioned operation, the fall return

actuation at the time of carrying out transfer detection as interruption processing at the time of carrying out coordination actuation is mentioned. However, not the thing limited to this but other processings can also be carried out to interruption processing. For example, when there is an instruction from a user, processing which executes the instruction can also be considered as interruption processing. Furthermore, only when the priority of the detected interruption processing is higher than coordination actuation in this way by measuring the priority of coordination actuation and such interruption processing in interrupting and processing, the interruption processing concerned can be performed.

[0088] Moreover, about the motion control of robot equipment which was explained with the gestalt of above-mentioned operation, it is also realizable with the program whose offer is enabled independently, and the program recorded on the record medium.

[0089] Moreover, explanation is added to below about the concrete configuration of animal mold robot equipment (quadrapedalism mold robot equipment) and humanoid robot equipment (bipod-walking-robot equipment).

[0090] The head unit 104 and the tail section unit 105 are connected, and animal mold robot equipment is constituted by the front end section and the back end section of the idiosoma unit 102, respectively while considering as the so-called pet mold robot of the configuration which imitated animals, such as a "dog", and

connecting the leg units 103A, 103B, 103C, and 103D with front and rear, right and left of the idiosoma unit 102, respectively, as shown in drawing 6 .

[0091] To the idiosoma unit 102, as shown in drawing 7 CPU (Central ProcessingUnit)110, DRAM (Dynamic Random Access Memory)111, a flash ROM (Read Only Memory) 112, PC () [Personal] The control section 116 formed by connecting the Computer card interface circuitry 113 and a digital disposal circuit 114 mutually through an internal bus 115 and the dc-battery 117 as a source of power of this animal mold robot equipment 100 are contained. Moreover, the angular-velocity sensor 118, an acceleration sensor 119, etc. for detecting the sense of animal mold robot equipment 100 and the acceleration of a motion are contained by the idiosoma unit 102.

[0092] Moreover, the CCD (ChargeCoupled Device) camera 120 for picturizing an external situation to the head unit 104, The touch sensor 121 for detecting the pressure received by "it strokes" and the physical influence of "striking" from a user, The distance robot 122 for measuring the distance to the body located ahead, LED (Light Emitting Diode) (not shown) equivalent to the microphone 123 for collecting alien frequencies, the loudspeaker 124 for outputting voice, such as a cry, and the "eye" of animal mold robot equipment 100 etc. is arranged in the predetermined location, respectively.

[0093] Furthermore, Actuators 1251-125n and Potentiometers 1261-126n for

free frequency are arranged in the joining segment of the joint part of each leg units 103A-103D, each joining segment of each leg units 103A-103D and the idiosoma unit 102, the head unit 104, and the idiosoma unit 102, and the list by the joining segment of tail 105A of the tail section unit 105, respectively. For example, Actuators 1251-125n have the servo motor as a configuration. The leg units 103A-103D are controlled by the drive of a servo motor, and it changes in a target posture or actuation.

[0094] And LED and 1251-125n of each actuator are connected with the digital disposal circuit 114 of the control section 116 through the hubs 1271-127n corresponding to various sensor lists, such as these angular-velocity sensor 118, an acceleration sensor 119, a touch sensor 121, a distance robot 122, a microphone 123, a loudspeaker 124, and each potentiometers 1261-126n, respectively, and direct continuation of CCD camera 120 and the dc-battery 117 is carried out to the digital disposal circuit 114, respectively.

[0095] 1I. of digital disposal circuits, 4 incorporates sensor data, and the image data and voice data which are supplied from each above-mentioned sensor one by one, and carries out sequential storing of these through an internal bus 115 in the predetermined location in DRAM111, respectively. Moreover, a digital disposal circuit 114 incorporates the dc-battery residue data showing the dc-battery residue supplied from a dc-battery 117 with this one by one, and

stores this in the predetermined location in DRAM111.

[0096] Thus, each sensor data stored in DRAM111, image data, voice data, and dc-battery residue data are used in case CPU110 performs motion control of this animal mold robot equipment 100 after this.

[0097] CPU110 stores direct read-out and this in DRAM111 for the control program stored in the memory card 128 or flash ROM 112 with which the PC Card slot which the idiosoma unit 102 does not illustrate was loaded through the PC card interface circuitry 113 at the time of the first stage when the power source of animal mold robot equipment 100 was switched on in practice.

[0098] Moreover, CPU110 judges [after this] the situation of self and a perimeter, the existence of the directions from a user, and influence, etc. from a digital disposal circuit 114 based on each sensor data by which sequential storing is carried out, image data, voice data, and dc-battery residue data to DRAM111 as mentioned above.

[0099] Furthermore, CPU110 can make the head unit 104 able to shake vertically and horizontally, can move tail 105A of the tail section unit 105, or makes it act by making the required actuators 1251-125n drive based on the decision result concerned to make it walk by making each leg units 103A-103D drive etc. while it opts for the action which stores in this decision result and DRAM111, and continues based on ****************.

[0100] Moreover, in this case, CPU110 generates voice data if needed, by giving this to a loudspeaker 124 as a sound signal through a digital disposal circuit 114, makes the voice based on the sound signal concerned output outside, or turns on, switches off or blinks above-mentioned LED.

[0101] Thus, in animal mold robot equipment 100, it is made as [act / according to the situation of self and a perimeter, the directions from a user, and influence / it / autonomously]. Thus, animal mold robot equipment 100 can control the mechanical component constituted uniquely by having a configuration for coordination actuation which was mentioned above to have the original configuration, and can make the actuation which cooperated to other robot equipments appear.

[0102] Next, humanoid robot equipment is explained. The appearance viewed from each of the front of humanoid robot equipment 200 and back is shown in drawing 8 and drawing 9 . Furthermore, the joint degree-of-freedom configuration which this humanoid robot equipment 200 possesses is typically shown in drawing 10 .

[0103] As shown in drawing 10 , humanoid robot equipment 200 consists of the truncus sections which connect an upper extremity including two arms and a head 201, the membrum inferius which consists of the two legs which realize migration actuation, and an upper extremity and the membrum inferius.

[0104] The neck joint which supports a head 201 has three degrees of freedom called the neck joint yawing axis 202, each joint pitching axis 203, and the neck joint roll axes 204.

[0105] Moreover, each carpus consists of the shoulder-joint pitching axis 208, the shoulder-joint roll axes 209, the overarm yawing axis 210, the elbow-joint pitching axis 211, the forearm yawing axis 212, a wrist joint pitching axis 213, a wrist joint roll ring 214, and a hand part 215. Hand parts 215 are the many joints and the multi-degree-of-freedom structure containing two or more fingers in fact. However, since there are little the contribution and effect to attitude control or walk control of humanoid robot equipment 200, actuation of a hand part 215 is assumed to be a zero degree of freedom on these specifications. Therefore, each arm presupposes that it has seven degrees of freedom.

[0106] Moreover, the truncus section has three degrees of freedom called the truncus pitching axis 205, the truncus roll axes 206, and the truncus yawing axis 207.

[0107] Moreover, each leg which constitutes the membrum inferius consists of the hip joint yawing axis 216, the hip joint pitching axis 217, the hip joint roll axes 218, the knee-joint pitching axis 219, an ankle joint pitching axis 220, ankle joint roll axes 221, and a foot 222. In this specification, it is a hip joint. The intersection of a pitching axis 217 and the hip joint roll axes 218 defines the hip

joint location of humanoid robot equipment 200. In fact, although the foot 22 of the body is the structure containing the vola of many joints and many degrees of freedom, the vola of humanoid robot equipment 200 makes it a zero degree of freedom. Therefore, each leg consists of six degrees of freedom.

[0108] If the above is summarized, as the humanoid robot equipment 200 whole, it will have 2= 3+7x2+3+6x32 degree of freedom in total. However, the humanoid robot equipment 200 for entertainment is not necessarily limited to 32 degrees of freedom.

[0109] The degree of means is mounted using an actuator in fact each one which humanoid robot equipment 200 which was mentioned above has. As for the request of eliminating an excessive swelling by the exterior and making it approximate in the shape of [human] a natural bodily shape, performing attitude control to the unstable structure called a 2-pair-of-shoes walk to an actuator, it is desirable that it is small and lightweight.

[0110] The control-system configuration of humanoid robot equipment 200 is typically shown in drawing 11 . As shown in this drawing, humanoid robot equipment 200 consists of each device unit 230,240,250 R/L and 260 R/L expressing the human limbs, and a control unit 280 which performs adaptive control for realizing coordination actuation between each device unit (however, each of R and L is a suffix which shows each of the right and the left.). the

following -- the same .

[0111] Actuation of the humanoid robot equipment 200 whole is controlled by the control unit 280 in generalization. A control unit 280 consists of circumference circuits 282 including the interface (neither is illustrated) which performs the data of the main control section 281 which consists of main circuit components (not shown), such as CPU (Central Processing Unit) and memory, and each component of a power circuit or humanoid robot equipment 200, and transfer of a command.

[0112] Especially the installation of this control unit 280 is not limited. Although carried in the truncus section unit 240 in drawing 11 , you may carry in the head unit 230. Or a control unit 280 is arranged out of humanoid robot equipment 200, and you may make it communicate with the airframe of humanoid robot equipment 200 by the cable or wireless.

[0113] Each joint degree of freedom in the humanoid robot equipment 200 shown in drawing 10 is realized by the actuator corresponding to each. That is, the neck joint yawing axis 202, the neck joint pitch 203, the neck joint yawing-axis actuator A2 expressing each of the neck joint roll axes 204, neck joint pitching-axis actuator A3, and neck joint roll-axes actuator A4 are arranged in the head unit 230.

[0114] Moreover, truncus pitching-axis actuator A5 expressing each of the

truncus pitching axis 205, the truncus roll axes 206, and the truncus yawing axis 207, the truncus roll-axes actuator A6, and the truncus yawing-axis actuator A7 are arranged in the truncus section unit 240.

[0115] Moreover, although subdivided by overarm unit 251 R/L, elbow-joint unit 252 R/L, and forearm unit 253 R/L, arm unit 250 R/L The shoulder-joint pitching-axis actuator A8, shoulder-joint roll-axes actuator A9 which the shoulder-joint pitching axis 8, the shoulder-joint roll axes 209, the overarm yawing axis 210, the elbow-joint pitching axis 211, the elbow-joint roll axes 212, the wrist joint pitching axis 213, and the wrist joint roll axes 214 express respectively, The overarm yawing-axis actuator A10, the elbow-joint pitching-axis actuator A11, the elbow-joint roll-axes actuator A12, the wrist joint pitching-axis actuator A13, and the wrist joint roll-axes actuator A14 are arranged.

[0116] Moreover, although subdivided by femoral region unit 261 R/L, knee unit 262 R/L, and leg part unit 263 R/L, leg unit 260 R/L The hip joint yawing-axis actuator A16, the hip joint pitching-axis actuator A17 expressing each of the hip joint yawing axis 216, the hip joint pitching axis 217, the hip joint roll axes 218, the knee-joint pitching axis 219, the ankle joint pitching axis 220, and the ankle joint roll axes 221, The hip joint roll-axes actuator A18, the knee-joint pitching-axis actuator A19, the ankle joint pitching-axis actuator A20, and the

ankle joint roll-axes actuator A21 are arranged.

[0117] The sub control sections 2235, 245, 255, and 265 of an actuator drive control section are arranged for every device unit, such as the head unit 230, the truncus section unit 240, arm unit 25O, and each leg unit 60. furthermore, each leg 260 -- while equipping with the touch-down check sensors 291 and 292 which detect whether the vola of R and L was implanted, the attitude sensor 293 which measures a posture is equipped in the truncus section unit 240.

[0118] The touch-down check sensors 291 and 292 consist of proximity sensors or micro switches etc. which were installed in the vola. Moreover, an attitude sensor 293 is constituted by the combination of an acceleration sensor and a gyroscope sensor.

[0119] the output of the touch-down check sensors 291 and 292 -- during periods of operation, such as a walk and transit, -- setting -- each leg on either side -- the present basis or **** -- it can distinguish whether it is in which condition. Moreover, the inclination and posture of a truncus part are detectable with the output of an attitude sensor 293.

[0120] The main control section 280 can answer the output of each sensors 291-293, and can amend control objectives dynamically. Accommodative control can be performed to each of the sub control section 235,245,255,265, and, more specifically, the upper extremity of humanoid robot equipment 200, the truncus,

and the membrum inferius can realize the exercise-of-the-whole-body pattern driven in cooperation.

[0121] the exercise of the whole body on the airframe of humanoid robot equipment 200 -- a foot -- while setting up movement, a ZMP (ZeroMoment Point) orbit, truncus movement, upper extremity movement, lumbar part height, etc., the command which directs actuation according to these contents of a setting is transmitted to each sub control section 235,245,255,265. And in each sub control sections 235 and 245 and ..., the receiving command from the main control section 281 is interpreted, and a drive control signal is outputted to each actuator A2, A3, etc. "ZMP" said here is a point on the floor line where the moment by the floor reaction force during a walk serves as zero, and a "ZMP orbit" means the locus to which ZMP moves during the walk actuation period of humanoid robot equipment 200.

[0122] These moments act on gravity, inertial force, and a list from a walk system at a road surface with the acceleration produced in connection with gravity and locomotion at the time of a walk. According to so-called "d'Alembert's principle", they balance with the floor reaction force as reaction from a road surface to a walk system, and the floor-reaction-force moment. As a conclusion of dynamic inference, the point (Zero Moment Point), i.e., "ZMP", that a pitch and the roll-axes moment serve as zero exists in the vola grounding point and side

top of the support polygon which a road surface forms, or its inside.

[0123] Many of proposals about posture stability control of a leg formula mobile robot or the fall prevention at the time of a walk are used as a norm of stability distinction of a walk of this ZMP. The bipedal-locomotion pattern generation based on a ZMP norm can set up the point landing [vola] beforehand, and has the advantage of being easy to take the kinematic constraint of the tip of a foot according to a road surface configuration into consideration. Moreover, since making ZMP into a stability distinction norm means treating not the force but an orbit as desired value on kinematic control, feasibility increases technically. In addition, the point which applies ZMP to the stability distinction norm of a bipedal robot at the conceptual list of ZMP is indicated by Miomir Vukobratovic work "LEGGED LOCOMOTION ROBOTS" (work outside Ichiro Kato "a bipedal robot and an artificial guide peg" (Nikkan Kogyo Shimbun)).

[0124] Generally, robots of a bipedal locomotion like a humanoid have a high center-of-gravity location, and the ZMP stable zone at the time of a walk is narrower than quadrapedalism. Therefore, the problem of the posture fluctuation accompanying change of such a road surface condition is divided in a bipod walking robot, and becomes important.

[0125] As mentioned above, each sub control sections 235 and 245, ..., etc. interpret the receiving command from the main control section 281, and

humanoid robot equipment 200 outputs a drive control signal to each actuator A2, A3, and ..., and is controlling the drive of each unit. Thereby, humanoid robot equipment 200 is made possible [walking with the stable posture]. Thus, humanoid robot equipment 200 can control the mechanical component constituted uniquely by having a configuration for coordination actuation which was mentioned above to have the original configuration, and can make the actuation which cooperated to the animal mold robot equipment 100 as other robot equipments appear.

[0126]

[Effect of the Invention] A receiving means by which the robot equipment concerning this invention receives the multiplexing performance information which it becomes from two or more PERT performance information through a driving member, means of communications, and means of communications, A PERT performance information extract means to extract the PERT performance information of self from the multiplexing performance information which the receiving means received, By having the control means of operation which controls the drive of a driving member based on the PERT performance information which the PERT performance information extract means extracted A receiving means receives the multiplexing performance information which consists of two or more PERT performance information through means of

communications. Based on the PERT performance information which extracted the PERT performance information of self from the multiplexing performance information which the receiving means received with the PERT performance information extract means, and the PERT performance information extract means extracted, the drive of a driving member is controllable by the control means of operation. Thereby, robot equipment can control the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and can make actuation appear.

[0127] Moreover, the motion-control approach of the robot equipment concerning this invention The receiving process which receives the multiplexing performance information which consists of two or more PERT performance information through means of communications with robot equipment, The PERT performance information extract process that robot equipment extracts the PERT performance information of self from the multiplexing performance information received at the receiving process, By having the motion-control process which controls the drive of the driving member of robot equipment based on the PERT performance information extracted at the PERT performance information extract process The drive of a driving member can be controlled based on the PERT performance information of self of the multiplexing performance information, and actuation can be made to appear to

robot equipment.

[0128] Moreover, the receiving process which receives the multiplexing performance information which the program concerning this invention becomes from two or more PERT performance information through means of communications, The PERT performance information extract process of extracting the PERT performance information of self from the above-mentioned multiplexing performance information received at the receiving process, It is the thing which makes robot equipment perform the motion-control process which controls the drive of a driving member based on the PERT performance information extracted at the PERT performance information extract process. The robot equipment which controls actuation by such program can control the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and can make actuation appear.

[0129] Moreover, the receiving process which receives the multiplexing performance information which the record medium concerning this invention becomes from two or more PERT performance information through means of communications, The PERT performance information extract process of extracting the PERT performance information of self from the multiplexing performance information received at the receiving process, The program which makes robot equipment perform the motion-control process which controls the

drive of a driving member based on the PERT performance information extracted at the PERT performance information extract process is recorded. The robot equipment which controls actuation by the program recorded on such a record medium can control the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and can make actuation appear.

[0130] Moreover, the control system of the robot equipment concerning this invention is equipped with a broadcast means to broadcast the multiplexing performance information which consists of two or more PERT performance information. Moreover, the control system of robot equipment is equipped with two or more robot equipments equipped with a driving member, means of communications, a receiving means to receive multiplexing performance information through means of communications, a PERT performance information extract means to extract the PERT performance information of self from the multiplexing performance information which the receiving means received, and the control means of operation that controls the drive of a driving member based on the PERT performance information which the PERT performance information extract means extracted.

[0131] The control system of robot equipment equipped with such a configuration can broadcast the multiplexing performance information which

consists of two or more PERT performance information with a broadcast means, and robot equipment can control the drive of a driving member by the control means of operation based on the PERT performance information which extracted the PERT performance information of self with a PERT performance-information extract means from the multiplexing performance information which received multiplexing performance information with the receiving means through means of communications, and the receiving means received, and a PERT performance-information extract means extracted. Thereby, robot equipment can control the drive of a driving member based on the PERT performance information of self of the multiplexing performance information, and can make actuation appear.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration for performing coordination actuation of the robot equipment concerning this invention.

[Drawing 2] It is drawing showing the configuration of the dance signal which each robot equipment for coordination actuation receives.

[Drawing 3] It is the flow chart which shows a series of down stream processing until it performs a dance motion based on a dance signal.

[Drawing 4] It is the flow chart which shows detailed down stream processing of the dance PERT decision in the flow chart of drawing 3 .

[Drawing 5] Each robot equipment is drawing showing the attribute information on the music data used for coordination actuation.

[Drawing 6] It is the perspective view showing the appearance configuration of animal mold robot equipment.

[Drawing 7] It is the block diagram showing the internal-circuitry configuration of animal mold robot equipment etc.

[Drawing 8] It is the perspective view showing the configuration of the humanoid robot equipment viewed from the front.

[Drawing 9] It is the perspective view showing the configuration of the humanoid robot equipment viewed from back.

[Drawing 10] It is drawing showing the connection condition of each right hand side of humanoid robot equipment.

[Drawing 11] It is drawing showing the drive system of humanoid robot equipment.

[Drawing 12] It is drawing showing the example of a configuration of the robot equipment of a bipedal locomotion.

[Drawing 13] It is drawing showing the example of a configuration of the robot equipment of quadrapedalism.

[Drawing 14] It is drawing showing one scene of the dance by the robot equipment of a bipedal locomotion.

[Drawing 15] It is drawing showing other one scene of the dance by the robot equipment of a bipedal locomotion.

[Description of Notations]

10a, the 10b environmental recognition processing section, 20 sensor section, the 21 communications department, 100 animal mold robot equipment, 200 humanoid-robot equipment Robot equipment, 11 A dance signal receive section, 12 The dance signal analysis section, 13 The dance PERT decision section, 14 A motion selector, 15 A motion controller, 16 A driving means, 17 The database section, 171 An external-environment database, 172 A specification database, 18 A fall detecting element, 19